Gaborone Technical College
REACHING HIGHER

Jessicca modise
[Course title]

SERVERIMPLEMENTATION

portfolio

Table of Contents

ACCRONYMES....2
GLOSSARY OF TERMS....3
SUMMARY OF EVIDENCE....4
LEARNING OUTCOME 4: TROBLESHOOT NETWORK SERVER PROBLEMS....7
PERFORMANCE CRITERIA: (A) EVALUATE SERVER PERFORMANCE AGAINST BASELINE....7
PROCESSOR....7
MEMORY....7
HARD DRIVES....9
NETWORK....9
PERFORMANCE CRITERIA: (B) DEMONSTRATE TECHNIQUES TO IDENTIFY NETWORK SERVER PROBLEMS....10
QUESTIONING....10
IDENTIFY CONTACTS....12
PERFORMANCE CRITERIA: (C) DETERMINE THE EFFECTS OF SERVER BOTTLENECKS....13
PROCESSOR....13
MEMORY....14
DISK SPACE....15
BUS TRANSFER....16
NICs (NETWORK INTERFACE CARDS)....17
NETWORK CONNECTIVITY....18
PERFORMANCE CRITERIA: (D) CARRY OUT SERVER DIAGNOSTICS....19
SYSTEMS LOGS....19
REMOTE TROUBLESHOOTING....20
CONFIGURATIONS....21
HARDWARE/SOFTWARE PROBLEMS....21
Bibliography....22

ACCRONYMES

CPU ..... Central Processing Unit
RAM .....Random Access Memory
NIC .....Network Interface Card
I/O ....Input/output
APM .....Application Performance Monitoring
LED ..... Light Emitting Diode
LAN ..... Local Area Network
WAN ..... Wide Area Network
HTTP ..... Hypertext Transfer Protocol
OS ..... Operating System
DNS ..... Domain Name System
VPN ..... Virtual Private Network
IP ..... Internet Protocol
TCP ..... Transmission Control Protocol
UDP ..... User Datagram Protocol
VLAN ..... Virtual Local Area Network
SLA ..... Service Level Agreement
SSD ..... Solid State Drive
PCIe ..... Peripheral Component Interconnect Express

GLOSSARY

Processor (CPU)..... The logic circuitry that executes instructions and processes data in a server, determining the speed and efficiency of computational tasks.

Memory (RAM).....Electronic components used to temporarily store data and instructions that the processor accesses quickly to perform tasks. Includes metrics like Pages/sec, Available Memory, and Page Faults/sec used in performance evaluation.

Page Faults.....Events occurring when data needed by a program is not found in RAM and must be retrieved from disk, affecting server performance if frequent.

Hard Drive.....A physical storage device that persistently stores digital information, crucial for server data retention and performance monitoring.

Questioning Technique……A troubleshooting method involving targeted, structured questions to identify network/server issues accurately.

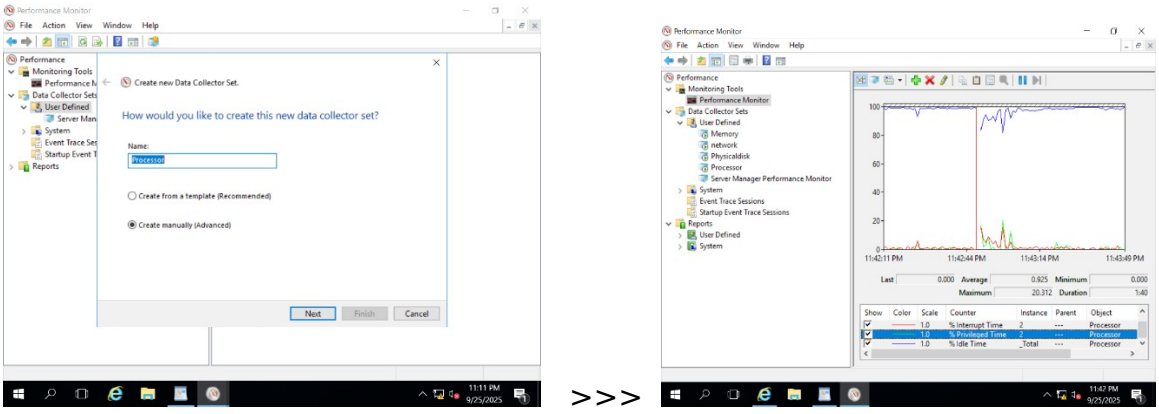
Server Bottleneck…… A point in the server system (CPU, memory, disk, bus, NIC, network) that limits overall performance due to overload or insufficient capacity.

Remote Troubleshooting……Diagnosing and resolving server or network issues from a remote location using network tools and software.

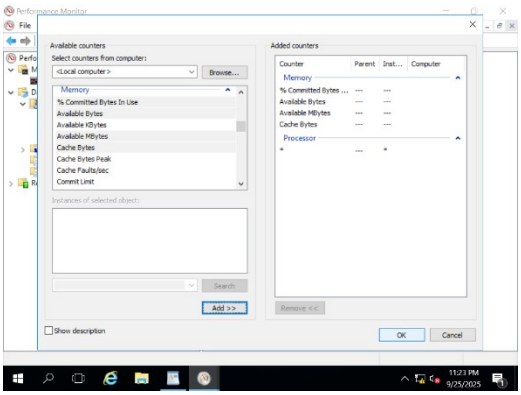
PERFORMANCE CRITERIA: (A) EVALUATE SERVER PERFORMANCE AGAINST BASELINE

PROCESSOR

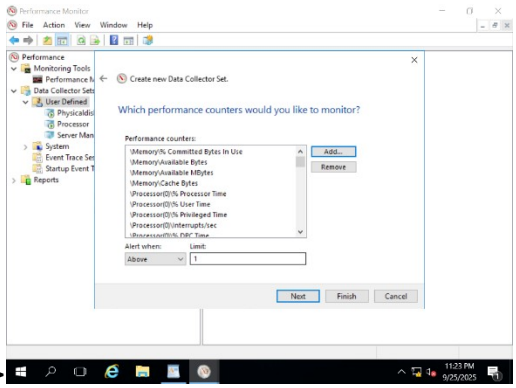
before after



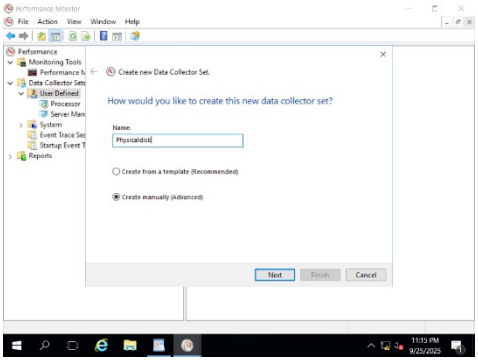
MEMORY



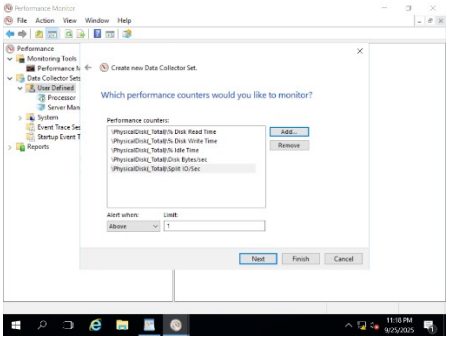
>>>



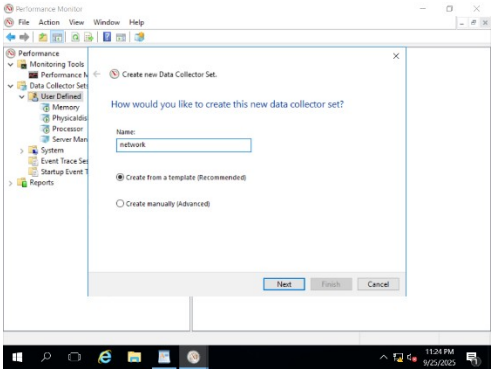
HARD DRIVES



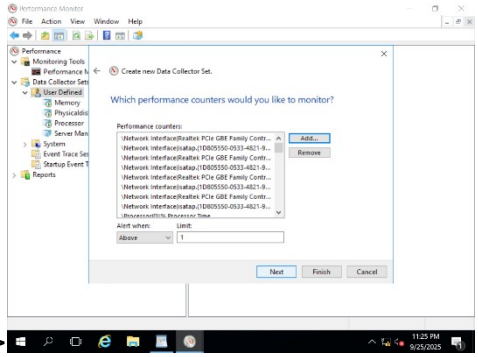
>>>



NETWORK



>>>



PERFORMANCE CRITERIA: (B) DEMONSTRATE TECHNIQUES TO IDENTIFY NETWORK SERVER PROBLEMS

QUESTIONING

Step-by-Step Demonstration: Questioning as a Technique to Identify Network Server Problems

1. Start with General Questions

Purpose: To understand the situation and symptoms.
Example Questions:

- “When did the problem start?”
- “Which programs or services are not working?”
- “Has this happened before?”

2. Ask Specific and Technical Questions

Purpose**:** To narrow down the possible causes.
Example Questions:

- “Can users log in, or is the whole server down?”
- “Can you open shared folders or databases?”
- “Were there any recent software or hardware changes?”

3. Ask Clarifying and Follow-Up Questions

Purpose: To verify details and avoid assumptions.
Example Questions:

- “Are all users affected or just some?”
- “What error message do you see?”
- “Did the issue start after a power cut or update?”

4. Ask Verification Questions

Purpose: To confirm the findings or solution.
Example Questions:

- “Did the problem continue after restarting the server?”
- “Can users now access the server properly?”

OBSERVE PROBLEM

as a technique to identify network server problems involves carefully monitoring and documenting the symptoms and behaviors of the network or server that indicate an issue.

Purpose of Observation

Observation helps identify visible or audible signs of failure before using diagnostic tools. This can quickly point to the root cause whether it’s hardware, network connection, or environmental**.**

Demonstration: Observing Problems to Identify Network Server Issues

Step 1: Visual Inspection

- Look at the server’s front panel for any warning lights (red or amber LEDs).

  - Example: A red light on a hard drive bay may indicate a disk failure.

- Check that network cables are properly connected and not damaged.
  - Example: A loose Ethernet cable could cause network disconnections.

Step 2: Listen for Unusual Sounds

- Pay attention to the server's fan and hard drive sounds**.**
  - Example: A grinding noise from a hard drive could indicate imminent hardware failure.

Step 3: Observe System Performance

- Watch for slow response times or frequent freezes on connected computers.
  - Example: Lagging applications may point to CPU or memory overload on the server.

Step 4: Check Server Room Environment

- Observe the temperature and ventilation of the server room.
  - Example: Overheating may cause automatic shutdowns or performance degradation.

Step 5: Monitor Indicators on Network Devices

- Check switches and routers for abnormal activity (blinking or no lights).
  - Example: No light on a network port may indicate loss of connectivity or power.

IDENTIFY CONTACTS

as a technique to identify network server problems generally involves locating and reaching out to specific individuals or groups who hold relevant knowledge or control over parts of the network infrastructure. [10]

Demonstration: Identifying Contacts to Identify Network Server Problems

Step 1: Identify key contacts such as the Network Administrator, ISP, or Vendor Support.

Step 2: Communicate with users to find out when and how the issue started.

Step 3: Contact technical teams or the ISP to check for outages or faults.

Step 4: Consult the System Administrator for server logs or maintenance details.

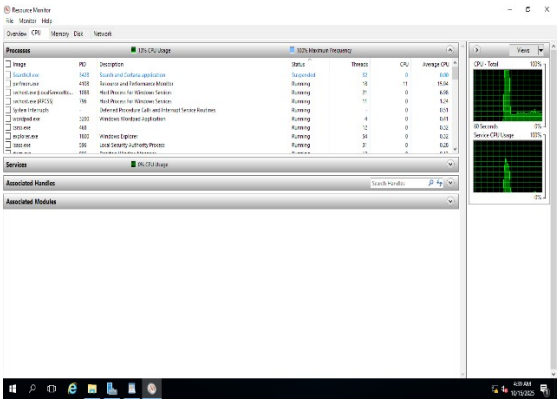
Step 5: Record all contacts and escalate the issue if not resolved.

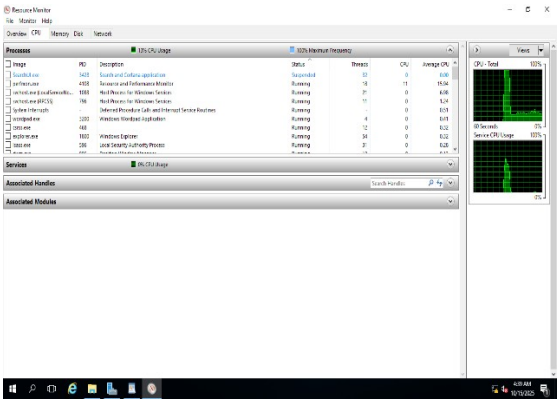
Purpose:
Helps gather accurate information, involve the right people, and speed up problem resolution.

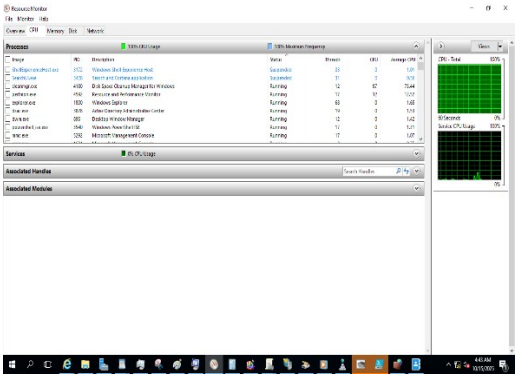
PERFORMANCE CRITERIA: (C) DETERMINE THE EFFECTS OF SERVER BOTTLENECKS

PROCESSOR

Before Bottleneck After Bottleneck







means the CPU is limiting the server's performance by being overloaded or too slow to keep up with other system components. This causes slow response and reduced efficiency because the CPU becomes the single point restricting overall speed.

Causes

- Too many simultaneous processes or user requests
- Outdated or low-performance CPU
- Inefficient software or background services using excessive CPU power
- Virtual machines or applications competing for CPU time

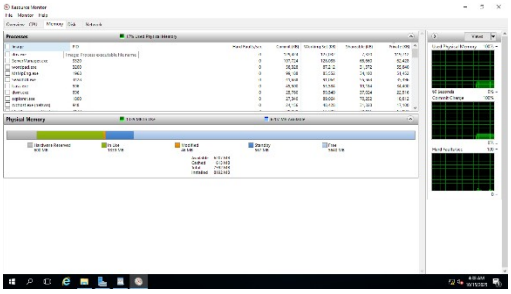
Effects and Solutions of a Processor Bottleneck

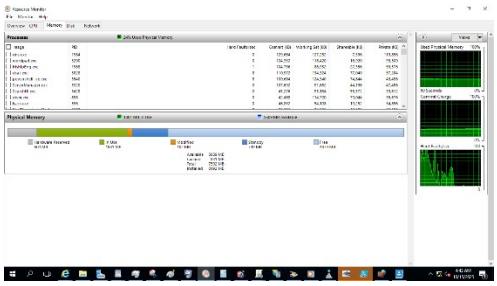
Effect	Description	Result/Impact	Possible solution
Slow Response Time	CPU takes too long to execute tasks	Applications or web services respond slowly	Upgrade CPU, optimize software, or distribute tasks using load

			balancing
High CPU Utilization (100%)	Processor constantly running at full capacity	New tasks are delayed or dropped	Add more CPU cores, use performance tuning, or disable unnecessary background processes
Degraded Application Performance	CPU cannot handle heavy application workloads	Applications freeze or slow down	Optimize application code, cache frequently used data, or upgrade to a higher-performance CPU

MEMORY

Before bottleneck After Bottleneck





A memory bottleneck is when a server's performance is limited by its memory (RAM), either because there isn't enough capacity or it's too slow for the CPU. This creates a slowdown because the CPU has to wait for data from the memory, or it must use a much slower storage device for data swapping when RAM is full.

Causes of Memory Bottleneck

This occurs when an application or process is allocated less memory than it requires to function optimally. As a result, the application or process is forced to constantly request additional memory from the system, which can significantly slow down its performance.

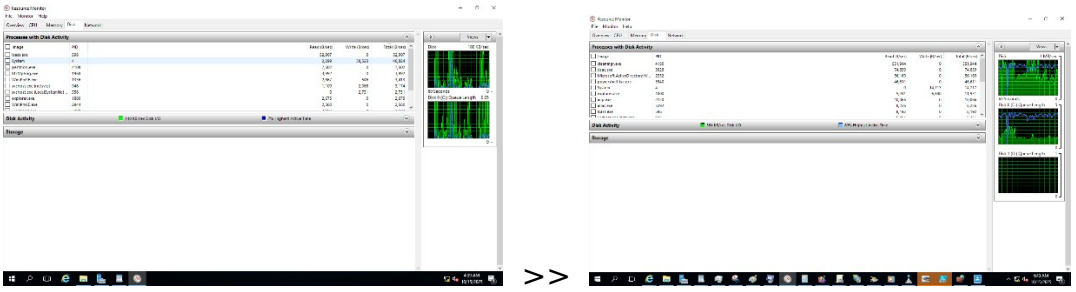
Effects of Memory as a server Bottleneck

Effect	Description
Slow Server	When memory is insufficient, the server slows

Performance	down because it relies on the hard drive for temporary data storage (paging/swapping).
High Disk Activity	The system constantly reads and writes to the disk to compensate for low RAM, causing slower data access.
Application Freezes or Crashes	Programs may stop responding or crash if there isn't enough memory to process their tasks.
Increased CPU Usage	The CPU works harder managing memory operations, reducing its ability to perform normal processing tasks.
Reduced Number of Users Supported	The server may handle fewer users or connections simultaneously due to limited memory resources.
Longer Response Time	Requests from clients take longer to be processed, reducing overall performance.
System Instability	Severe memory shortage can lead to system errors, unresponsiveness, or unexpected reboots.

DISK SPACE

Before Bottleneck After Bottleneck



when a server's storage capacity becomes full or nearly full, preventing it from saving new data, creating temporary files, or running applications efficiently.

Effect	Description	Possible Solutions
Slow Server Response	The CPU takes too long to execute tasks, causing delays in user requests and application responses.	Upgrade to a faster or multi-core CPU.
High CPU Utilization (100%)	The processor runs at full capacity constantly, leading to overheating and degraded performance.	Optimize software or reduce background processes.

Application Lag or Freezing	Services or applications may become unresponsive when the CPU cannot handle simultaneous processes.	Distribute workload using load balancing or virtualization. [14]

BUS TRANSFER

A bus transfer bottleneck occurs when the data transfer speed of a system's bus is slower than the rate at which components, like a CPU or storage device, can process data. [15]

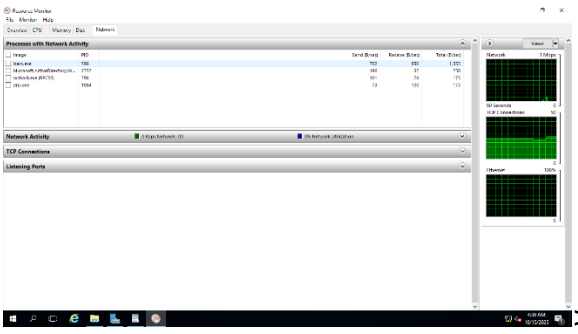
Effects of a bus transfer bottleneck

Effect	Description	Possible Solutions
Slow Data Transfer Rate	The system takes longer to move data between the CPU, memory, and storage, reducing overall speed.	Upgrade to a faster bus architecture (e.g., PCIe instead of PCI)
Underutilized Components	Fast components (like SSDs or CPUs) wait idly because the bus cannot transfer data quickly enough.	Use high-speed interfaces (e.g., NVMe for storage, faster RAM).
System Lag and Latency	Tasks that require rapid data movement	Optimize data paths or increase bus

	(like virtualization or database queries) experience noticeable delays	bandwidth.
Reduced Throughput	The total amount of data processed per second decreases, affecting server performance and response time.	Enable multi-channel or dual-bus configurations if supported.
Performance Bottlenecks Under Heavy Load	As data traffic increases, the bus becomes overloaded, leading to system slowdowns or queue buildup.	Use server architectures with higher bus speeds or parallel data paths. [16]

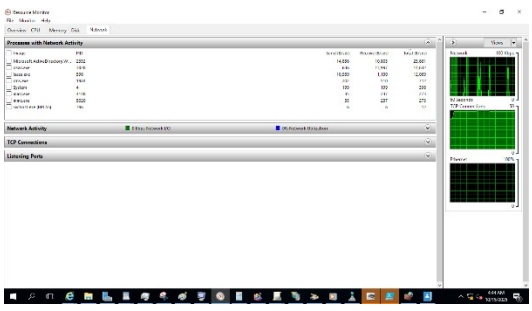
NICs (NETWORK INTERFACE CARDS)

Before Bottleneck



>>>>

After Bottleneck



becomes a server bottleneck when it cannot handle the volume of network traffic being sent or received. This means data transfer between the server and the network slows down, affecting overall performance and communication efficiency.

Effects of NICs as a Server Bottleneck

Effect	Description	Possible Solutions
Slow Network Performance	Data transfer between the server and clients becomes slow due to limited NIC bandwidth.	Upgrade to a higher-speed NIC (e.g., from 1 Gbps to 10 Gbps).
High Network Latency	Packets take longer to travel across the network, leading to delayed responses in applications.	Use low-latency NICs or optimize network configurations.
Dropped or Lost Packets	The NIC becomes overloaded and fails to process all incoming/outgoing packets, causing data loss.	Enable flow control or use NICs with better buffering capacity.
Server Communication Delays	Network services like web hosting, file sharing, or database access slow down.	Use multiple NICs (NIC teaming or bonding) to increase throughput.
Connection Timeouts or Failures	Users may experience disconnections or timeouts during data transfers.	Upgrade network infrastructure (switches, routers, cables). [17]

NETWORK CONNECTIVITY

When the server’s connection to the network is too slow, unstable, or limited to handle the required data traffic. This leads to reduced performance and poor communication between systems.

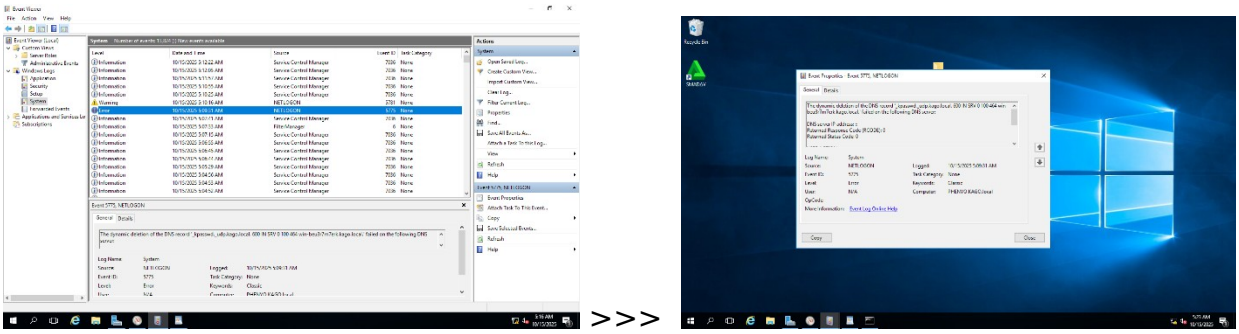
Effects of Network Connectivity as a Server Bottleneck

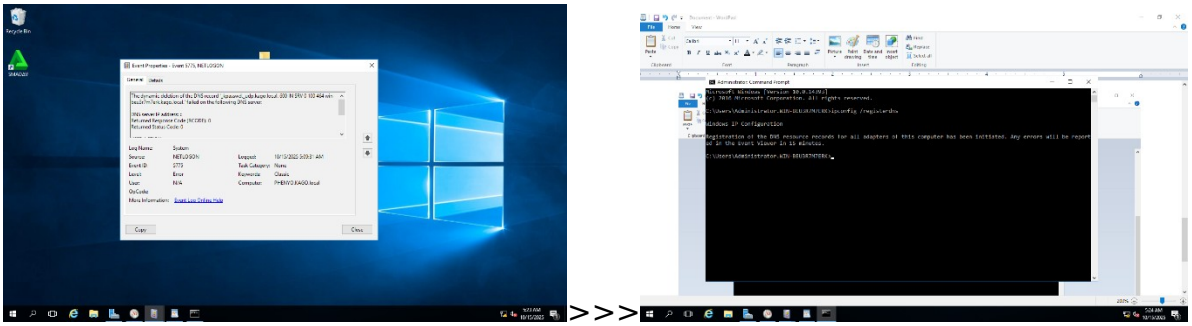
Effect	Description	Possible solutions
High Latency (Delays)	Delayed responses in applications, especially in real-time services	Optimize routing paths or use faster switches and routers.

	like VoIP or remote access.	
Frequent Disconnections	Unstable connectivity can cause dropped sessions or failed connections to the server.	Check cables, ports, and replace faulty network hardware.
Packet Loss	Data packets fail to reach their destination, causing incomplete data transfer and retransmissions.	Improve cabling, reduce interference, and configure error correction.
Network Congestion	Too much traffic on the network slows down communication between servers and clients.	Segment the network (VLANs) or use load balancing.
Poor Application Performance	Applications that rely on constant connectivity (e.g., databases, web servers) slow down or time out.	Use better networking protocols (like TCP optimization).
Underutilized Server Resources	CPU and memory may stay idle while the server waits for network data to arrive.	Match network capacity with server performance. [18]

PERFORMANCE CRITERIA: (D) CARRY OUT SERVER DIAGNOSTICS

SYSTEMS LOGS





System logs are records of events and activities that occur within a server's operating system, applications, and hardware components.
They are a key server diagnostic tool used **to** monitor performance, detect errors, and troubleshoot problems.

how it is done step by step:

1. **Open Event Viewer**:
   - Press Windows + R, type eventvwr.msc, and press Enter.
   - Alternatively, click the Start button, type "Event Viewer", and open the app.
- **Navigate to the System log**:
   - In the left-hand pane, expand Windows Logs.
   - Click on System to view the system-level events.
- **Analyze the logs**:
   - The main window will display a list of events, including their level, source, and date/time.

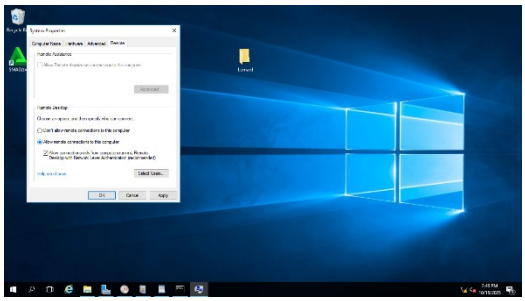
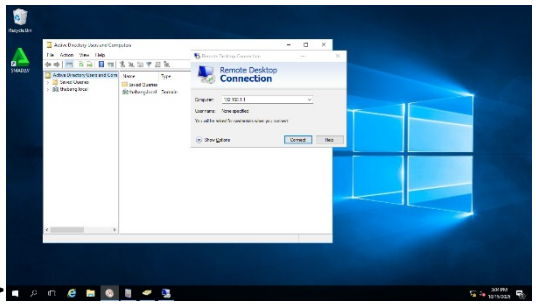
- You can sort the logs by clicking on a column header to help identify recent issues.

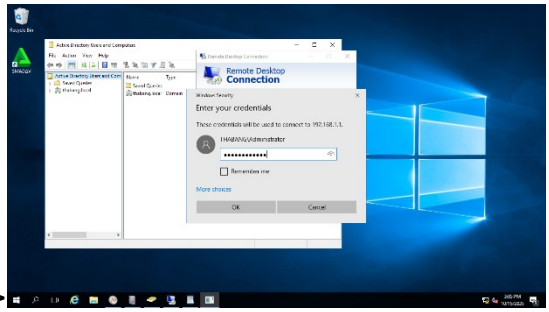
- **Save the logs**:
- Click on the System log in the left pane to make sure it is selected.
- In the Action menu at the top, click Save All Events As.
- Choose a location, give the file a name, and select the desired file type (usually *.evtx or *.evt), then click Save.

- **Repeat for other logs**:
- You can repeat this process for other logs, such as the Application log, to get a more complete picture of the system's behavior. [19]

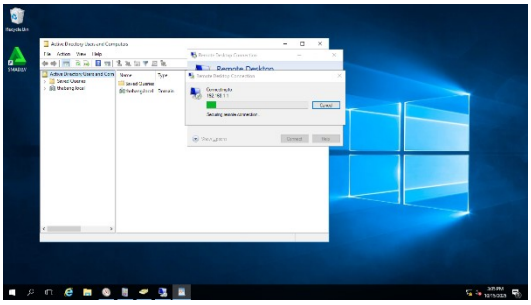
REMOTE TROUBLESHOOTING

Remote troubleshooting is the process of diagnosing and fixing problems in a computer or network from a distance. [20]


>>>> 
>>>>>

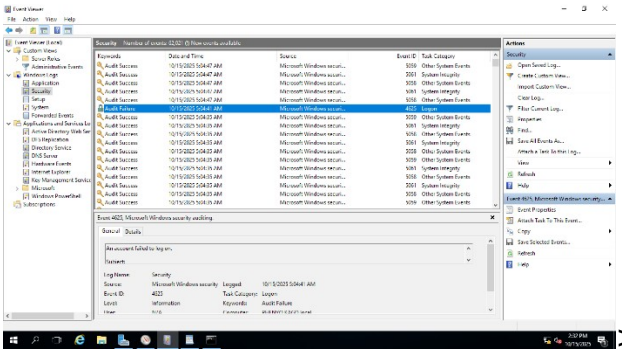
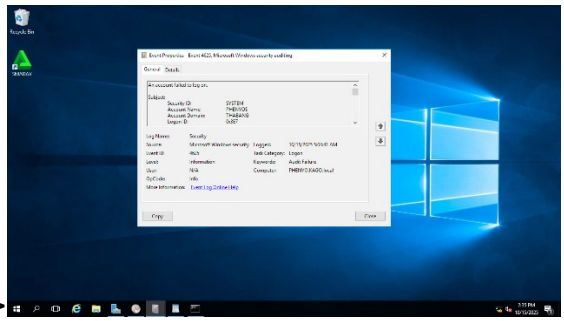


>>>>>>>>



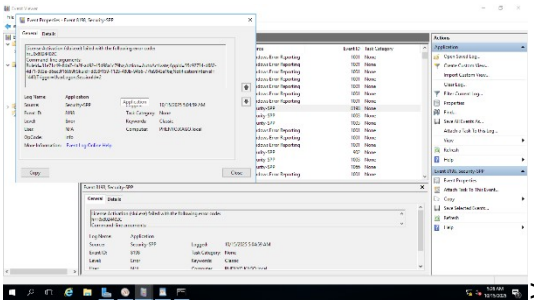
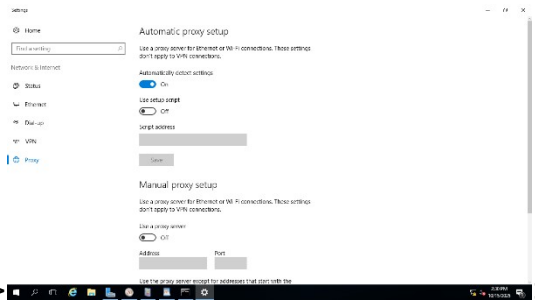
CONFIGURATIONS

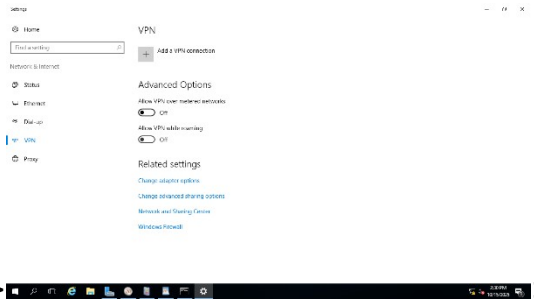
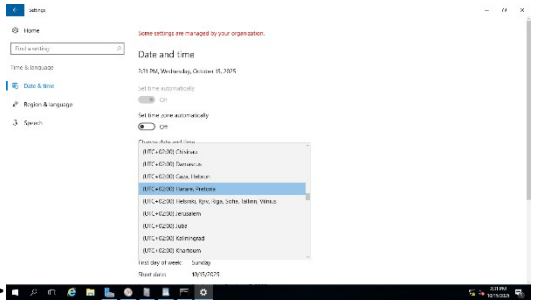
refer to the specific settings and parameters of the server and network devices that are examined and adjusted to identify and resolve connectivity, performance, or system failures. [21]

 >> 

HARDWARE/SOFTWARE PROBLEMS

refer to identifying issues arising from server hardware components or software systems that affect the server's operation within the network. [22]


>>>

>>>


>>

>>>>

Bibliography

[1] techtarget.com, "www.techtarget.com," 14 August 2019. [Online]. Available: https://www.techtarget.com/whatis/definition/processor. [Accessed 15 October 2025].

[2] lenovo.com, "www.lenovo.com," lenovo.com, 2025. [Online]. Available: https://www.lenovo.com/us/en/glossary/what-is-a-computer-hard-drive/?orgRef=https%253A%252F%252Fwww.perplexity.ai%252F. [Accessed 16 October 2025].

[3] IONOS editorial team, "www.ionos.com," ionos.com, 10 May 2020. [Online]. Available: https://www.ionos.com/digitalguide/server/know-how/what-is-a-network/. [Accessed 16 October 2025].

[4] geeksforgeeks.org, "www.geeksforgeeks.org," 23 July 2025. [Online]. Available: https://www.geeksforgeeks.org/computer-networks/network-troubleshooting-techniques/. [Accessed 17 October 2025].

[5] lenovo.com, "www.lenovo.com," 2025. [Online]. Available: https://www.lenovo.com/us/en/glossary/cpu-bottlenecking/?orgRef=https%253A%252F%252Fwww.google.com%252F. [Accessed 19 October 2025].

[6] R. Sheldon, "www.techtarget.com," 14 September 2022. [Online]. Available: https://www.techtarget.com/whatis/definition/von-Neumann-bottleneck#:~:text=The%20system%20bus%20is%20used,spend%20more%20time%20sitting%20idle.. [Accessed 19 October 2025].

[7] lenovo.com, "www.lenovo.com," lenovo.com, 2025. [Online]. Available: https://www.lenovo.com/us/en/glossary/what-is-input-output-bus/?orgRef=https%253A%252F%252Fwww.google.com%252F. [Accessed 19 October 2025].

[8] flashedgecdn.com, "www.flashedgecdn.com," flashedgecdn.com, 2025. [Online]. Available: https://www.flashedgecdn.com/blog/bottleneck-networking/. [Accessed 19 October 2025].

[9] S. J. B. Andrew Froehlich, "www.techtarget.com," 28 September 2021. [Online]. Available: https://www.techtarget.com/searchnetworking/definition/bottleneck. [Accessed 19 October 2025].

[10] dell.com, "www.dell.com," 09 December 2024. [Online]. Available: https://www.dell.com/support/kbdoc/en-us/000134674/export-system-logs-and-application-logs-on-windows-server-2012-2016-for-poweredge-servers#:~:text=Instructions-,Affected%20Products,View%20More. [Accessed 20 October 2025].

[11] alooba.com, "www.alooba.com," 2025. [Online]. Available: https://www.alooba.com/skills/cognitive-abilities/remote-support-190/remote-troubleshooting/. [Accessed 20 October 2025].

[12] A. Lamberti, "https://obkio.com," 12 May 2023. [Online]. Available: https://obkio.com/blog/network-diagnostics-with-obkio/. [Accessed 20 October 2025].

[13] N. Maguire, " www.procurri.com," 26 January 2025. [Online]. Available: https://www.procurri.com/2025/01/26/how-to-troubleshoot-common-server-issues/. [Accessed 20 October 2025].

[14] D. Farinelli, "https://raygun.com," 11 July 2023. [Online]. Available: https://raygun.com/blog/server-performance-metrics/. [Accessed 16 October 2025].

[15] liveaction.com, "www.liveaction.com," 06 November 2020. [Online]. Available: https://www.liveaction.com/resources/blog-post/what-is-network-performance-baselining/. [Accessed 16 October 2025].

[16] learn.microsoft.com, "https://learn.microsoft.com," 29 April 2024. [Online]. Available: https://learn.microsoft.com/en-us/answers/questions/1661254/how-

to-create-a-baseline-using-counters-to-analyze. [Accessed 16 October 2025].

[17] K. Herbert, "www.techtarget.com," techtarget.com, 17 January 2024. [Online]. Available: https://www.techtarget.com/whatis/feature/15-server-and-networking-interview-questions-and-answers. [Accessed 17 October 2025].

[18] networkdefenseblog.com, "www.networkdefenseblog.com," 31 December 2023. [Online]. Available: https://www.networkdefenseblog.com/post/network-troubleshooting-tips. [Accessed 17 October 2025].

[19] study-ccna.com, "https://study-ccna.com," study-ccna.com, 2025. [Online]. Available: https://study-ccna.com/network-troubleshooting-methodology-techniques/. [Accessed 17 October 2025].

[20] A. Froehlich, "www.techtarget.com," techtarget.com, 28 September 2021. [Online]. Available: https://www.techtarget.com/searchnetworking/definition/bottleneck. [Accessed 18 October 2025].

[21] S. Lavrynenko, "www.otakoyi.software.com," 31 December 2024. [Online]. Available: https://otakoyi.software/blog/how-to-identify-and-fix-software-performance-bottlenecks-before-they-impact-your-business. [Accessed 18 October 2025].

[22] sematext.com, "https://sematext.com," 2025. [Online]. Available: https://sematext.com/glossary/memory-bottleneck/. [Accessed 18 October 2025].